

**PRESSURE-SENSITIVE ADHESIVE, PRESSURE-SENSITIVE ADHESIVE MEMBER
AND ITS PRODUCTION**

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Abstract of JP2011684

PURPOSE:To obtain the title adhesive which scarcely undergoes stringing during application and flow deformation after application and can be applied to a predetermined pattern at a high speed in good precision by imparting thixotropic viscosity characteristics to an acrylic pressure-sensitive adhesive having an alkyl acrylate as a component and containing the component monomer in an unpolymerized state by adding thereto specified particles. **CONSTITUTION:**An alkyl acrylate comprising a (meth)acrylic acid having an alkyl group of, desirably, 20 or less carbon atoms is used as a component, and 100 pts.wt. this ester is optionally mixed with, desirably, at most 100 pts.wt. modifying monomer (e.g., acrylic acid). An acrylic pressure-sensitive adhesive containing these component monomers in an unpolymerized state is mixed with 1-20 pts.wt., per 100 pts.wt. component monomer, fine particles which can impart thixotropic viscosity characteristics to the adhesive and are selected from white carbon and carbon black each having a mean particle diameter $\leq 100\mu\text{m}$.

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⑮ 発明の名称 感圧接着剤並びにその粘着部材及びその製造方法

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明 細 書

1. 発明の名称 感圧接着剤並びにその粘着部材及
びその製造方法

2. 特許請求の範囲

1. アクリル酸系アルキルエステルを成分とし、
成分モノマを未重合のまま含有するアクリル
系感圧接着剤に、平均粒径が100 nm以下の微
粒子を混合してチキソトロピーな粘度特性を
付与したことを特徴とする感圧接着剤。

2. 支持基材上に部分的に塗布された請求項1
に記載の感圧接着剤を重合処理してなること
を特徴とする感圧接着層を部分的に有する粘
着部材。

3. 請求項1に記載の感圧接着剤を支持基材上
に部分的に塗布し、その感圧接着剤を紫外線
ないし放射線で重合処理することを特徴とす
る請求項2に記載の粘着部材の製造方法。

3. 発明の詳細な説明

産業上の利用分野

本発明は、モノマー型のアクリル系感圧接着剤

に微粒子を配合してなり、パターニング工性の良好
な感圧接着剤、並びにその感圧接着層を部分的に
有する粘着部材、及びその製造方法に関する。

発明の背景

支持基材上に感圧接着層を部分的に設けてなる
粘着部材の提供が課題となつて久しい。かかる粘
着部材は、例えば電子部品等の種々の被着体を連
続的に組立ライン等へ導入して目的とする製品を
自動的に製造する方法において、被着体を連続固
定するためのキャリアテープなどとしても利用さ
れる。この場合、感圧接着層の部分的付設ないし
パターニング工の要請は、被着体の接着に利用され
ない無駄部分の形成の省略もさきながら、その無
駄部分に塵等が付着しやすくてこれが被着体汚染
の原因となること、また被着体を連続固定したキャ
リヤテープを巻回物として保管したときに、被着
体が感圧接着層中に極僅かではあるが埋没し、そ
のため被着体の側面が感圧接着剤で汚染されて組
立作業の妨げとなること、さらにその埋没のため
に被着体をキャリアテープより剥離除去すること

が困難となり自動組立ラインへの適用が不能になるなど、感圧接着層の不要部分が致命的欠陥を誘発する場合があること等に基づく。

従来の技術及び課題

従来、支持基材上に部分的に付設する用途に向けて調製した感圧接着剤としては、溶剤リッチな希釈溶液型のもの、水分散型のもの、成分モノマを未重合のまま含有するモノマー型感圧接着剤にポリマを配合したものが知られていた。

しかしながら、希釈溶液型の感圧接着剤においては、スクリーン印刷方式やグラビア塗工方式等でパターン塗工する際に感圧接着剤が糸引きを起こし、その予防のため塗布速度を極めて遅くする必要があり塗布効率に劣る問題点があった。

一方、水分散型の感圧接着剤にあっては、形成される感圧接着層が耐水性等に乏しく、実用上の制約が大きい問題点があった。

他方、モノマー型感圧接着剤にポリマを配合してなるものは、支持基材に塗布した直後から流動を始め、重合処理時にはすでに塗布パターンが変

形しており、感圧接着層を所望のパターンに形成しにくい問題点があった。

課題を解決するための手段

本発明は、モノマー型のアクリル系感圧接着剤に微粒子を配合してなるものにより上記の課題を克服したものである。

すなわち、本発明は、アクリル酸系アルキルエステルを成分とし、成分モノマを未重合のまま含有するアクリル系感圧接着剤に、平均粒径が100 nm以下の微粒子を混合してチキソトロピーな粘度特性を付与したことを特徴とする感圧接着剤、並びに

支持基材上に部分的に塗布された前記の感圧接着剤を重合処理してなることを特徴とする感圧接着層を部分的に有する粘着部材、及び

上記した感圧接着剤を支持基材上に部分的に塗布し、その感圧接着剤を紫外線ないし放射線で重合処理することを特徴とする前記した粘着部材の製造方法を提供するものである。

作用

モノマー型のアクリル系感圧接着剤を用いることにより、適宜な成分モノマ組成とすることができ、耐水性に優れる感圧接着層も容易に形成することができる。そして、これに平均粒径が100 nm以下の微粒子を混合してその粘度を上昇させると共に、チキソトロピーな粘度特性を付与することにより、感圧接着剤の塗布時における糸引き問題が回避されて高速パターン塗工が可能になり、かつ形成された塗布層がそのパターンないし形状を良好に維持する。さらに、部分的に塗布された感圧接着剤を紫外線ないし放射線により重合処理することにより、塗布後速やかに、かつ効率的に重合処理できてパターン精度に優れる感圧接着層を形成することができる。

発明の構成要素の例示

本発明においては、モノマー型のアクリル系感圧接着剤、すなわち成分モノマを未重合のまま含有するアクリル系感圧接着剤が用いられる。

そのアクリル系感圧接着剤はアクリル酸系アルキルエステルを成分とする。メチル基、エチル基、

プロピル基、ブチル基、2-エチルヘキシル基、イソオクチル基、イソノニル基、イソデシル基、ドデシル基、ラウリル基、トリデシル基、ペンタデシル基、ヘキサデシル基、ヘプタデシル基、オクタデシル基、ノナデシル基、エイコシル基の如き通例、炭素数が20以下のアルキル基を有するアクリル酸ないしメタクリル酸からなるアクリル酸系アルキルエステルが1種又は2種以上用いられる。

アクリル系感圧接着剤を形成するモノマ成分として用いられることのあるその他のモノマとしては、アクリル酸、メタクリル酸、イタコン酸、アクリル酸ヒドロキシエチル、メタクリル酸ヒドロキシエチル、アクリル酸ヒドロキシプロピル、メタクリル酸ヒドロキシプロピル、N-メチロールアクリルアミド、アクリロニトリル、メタクリロニトリル、アクリル酸グリシジル、メタクリル酸グリシジル、酢酸ビニル、スチレンなどで代表される改質モノマがあげられる。改質モノマは架橋性の付与、凝集力の向上、接着力の向上、耐水性

の向上などその改質目的に応じ1種又は2種以上が必要に応じ用いられる。改質モノマの使用量は適宜に決定されるが、通常アクリル酸系アルキルエステル100重量部あたり100重量部以下、就中50重量部以下である。

本発明で用いるアクリル系感圧接着剤には、ラウリルメルカプタンやチオグリコール酸の如き重合調節剤、多官能性エポキシ系化合物、多官能性イソシアネート系化合物、多官能性メラミン系化合物の如き接着力や凝集力等を調節するための架橋剤、ジビニルベンゼン、エチレングリコールジアクリレート、トリメチロールプロパントリメタクリレートの如き多官能性化合物からなる架橋調節剤などが必要に応じ配合される。その配合量は適宜に決定されるが、通常成分モノマ100重量部あたり50重量部以下、就中10重量部以下である。

また、紫外線で重合処理する場合には、ベンゾイン、ベンゾインメチルエーテル、ベンゾフェノン、アントラキノン、 α -ブチルアントラキノン、ジエトキシアセトフェノンなどの公知の光重合開

始剤が必要に応じ配合される。その配合量は通常、成分モノマ100重量部あたり0.05~10重量部が適当である。

本発明の感圧接着剤は、アクリル系感圧接着剤に平均粒径が100 μ m以下の微粒子を混合したものからなる。

微粒子はアクリル系感圧接着剤の粘度特性調節剤として混合される。混合量は成分モノマ100重量部あたり1~20重量部が適当であり、3~15重量部が好ましい。その混合量が1重量部未満ではチキソトロピーな粘度特性の付与効果に乏しく、得られる感圧接着剤がその塗布層のパターン維持性に乏しくなる。一方、20重量部を超えると得られる感圧接着剤が接着力に乏しくなる。

用いる微粒子はアクリル系感圧接着剤の粘度特性をチキソトロピーにするものであればよい。就中、ホワイカーボン、カーボンブラックが好ましく用いられる。チキソトロピーな粘度特性の付与の点よりは平均粒径が5~50 μ mの微粒子が好ましい。微粒子は必要に応じ2種以上を併用してよ

い。感圧接着剤を紫外線で重合処理する場合には、その処理性の点よりホワイカーボンが好ましく用いられる。ホワイカーボンについては、例えばアエロジル#200や同#300(商品名、アエロジル社製)、ニブシルVN3(商品名、日本シリカ工業社製)などの市販品があり、カーボンブラックについては旭#80や同#70H(商品名、旭カーボン社製)、シースト3や同3H(商品名、東海電極社製)などの市販品がある。

本発明の感圧接着剤ないしその形成に用いるアクリル系感圧接着剤には、粘度や流動特性の調節、接着特性の調節などを目的として有機溶剤、ポリマないしゴム、共重合性マクロモノマ、粘着性付与樹脂、可塑剤などを添加してよい。また、発泡剤ないしマイクロバルーンを添加して発泡構造を形成し得るようにしてもよい。添加量は適宜に決定してよい。

感圧接着剤の調製に際しては、アクリル系感圧接着剤、微粒子、その他必要に応じ用いられる配合剤ないし添加剤を適宜な順序で混合してよい。

均一混合系に調製することが特に好ましい。混合には、その粘度に応じニーダ、ミキシングロール、三本ロール、サンドミル、ボールミル、ホモミキサ、超音波発生機、ディスパ、ホモジナイザ、ディゾルバなどの攪拌分散機を1種又は2種以上適宜に組合せて使用してよい。

本発明の粘着部材は、かかる感圧接着剤を支持基材の上に部分的に塗布し、これを重合処理して感圧接着層を部分的に形成したものである。

その製造は例えば、スクリーン印刷方式やグラビア塗工方式等の適宜な部分塗布方式で、感圧接着剤を支持基材上に部分的に塗布し、その塗布層を紫外線ないし放射線で重合処理することにより行うことができる。感圧接着剤の塗布パターンは任意であり、使用目的に応じ適宜に決定してよい。電子部品等からなる被着体のキャリヤテープを得る場合には例えば、被着体の所定の連設間隔に対応した間隔で、被着体における接着面の形状に対応した形状、ないしそれよりも小さい面積で感圧接着層が設けられる。

支持基材としては適宜なものを用いてよい。第1図に例示したように、ポリエチレン、ポリプロピレン、ポリエステル等の如きプラスチックフィルム、発泡シート、紙ないしラミネート紙、織布ないし不織布、そのラミネート体、金属箔の如き薄葉体2を支持基材に用いて、感圧接着層1を部分的に有するキャリアテープや粘着テープなどとしてもよいし、金属板やガラス板等の被着体を支持基材に用いて、他の被着体に接着できるようにしてもよい。また、プラスチックフィルムやラミネート紙等を剥離剤で処理するなどして形成したセパレータを支持基材に用いてもよい。この場合には、セパレータ上の感圧接着層を被着体に移着させる糊転写テープなどを得ることができる。第2図に例示したように、感圧接着層1をセパレータ3上にドット状に点在させると任意な形状の被着体に対して適用できる糊転写テープとすることができる。糊転写テープはその感圧接着層1に被着体を接着させてそれを剥離することにより、被着体に感圧接着層が転写ないし移着して被着体への

従って、かかる感圧接着剤により被着体に対して無駄部分のない感圧接着層を有する粘着部材を容易に得ることができる。また、形成された粘着部材は、パターン形成精度に優れた感圧接着層を有する。さらに、紫外線ないし放射線による重合処理により発泡シートを基材とする粘着部材なども容易にかつ効率よく得ることができる。

実施例

実施例1

アクリル酸ブチル97部(重量部、以下同じ)、アクリル酸3部、エチレングリコールジアクリレート0.2部及び α -ブチルアントラキノン0.5部の混合液からなるモノマー型のアクリル系感圧接着剤に、平均粒径が7 μm のホワイトカーボン6部を加えてホモミキサで混合し、均一分散液からなる感圧接着剤を調製した。

次に、前記の感圧接着剤を厚さ50 μm のポリエステルフィルムの上にスクリーン印刷方式で50 μm の厚さで部分的に塗布した。塗布速度は0.1m/秒である。また、部分塗布のパターンは直径10mmの

感圧接着層の付設形態が形成されるので、粘着テープを被着体の形状に応じた寸法に切断成形処理する必要をなくすることができる利点を有する。

支持基材への感圧接着剤の塗布厚さは適宜に決定してよい。本発明では、3mmを超える塗布層ないし感圧接着層の形成も可能である。

紫外線、あるいは電子線等の放射線による部分塗布した感圧接着剤の重合処理は、窒素ガス置換下、水中、セパレータ等の透明カバー材による被覆処理下などの酸素遮断雰囲気下に行うことが重合性の点で好ましい。

発明の効果

本発明によれば、モノマー型のアクリル系感圧接着剤に微粒子を混合してチキソトロピーな粘着特性を有する感圧接着剤としたので、塗布時の糸引きや塗布後の流動変形を起こしにくく、所定形状のパターンに精度よく、かつ高速に部分塗工することができる。また、厚さの均一性に優れた塗布層や、層厚の大きい塗布層の形成性にも優れている。

円が5mmの間隔で点在するものとした。

ついで、前記の塗布物を窒素雰囲気下に80W/cmのメタハライドランプを用いて20cm離れた位置より紫外線を20秒間照射し、感圧接着剤を重合処理して感圧接着層が点在する粘着部材を得た。

実施例2

アクリル酸ブチル98部とアクリル酸2部の混合液からなるモノマー型のアクリル系感圧接着剤に、平均粒径が50 μm のカーボンブラック6部を加えてホモミキサで混合し、均一分散液からなる感圧接着剤を調製した。

次に、前記の感圧接着剤を厚さ5mmのポリエチレンの発泡体上にグラビアコートにより30 μm の厚さで部分的に塗布した。塗布速度は0.1m/秒である。また、部分塗布のパターンは直径2mmの円が1mmの間隔で点在するものとした。

ついで、前記の塗布物を窒素雰囲気下に電子線放射装置を用いて7Mradの電子線を照射し、感圧接着剤を重合処理して感圧接着層が点在する通

気性の良好な粘着部材を得た。

実施例 3

アクリル酸イソノニル90部、酢酸ビニル8部、メタクリル酸2部、多官能性イソシアネート2部及び α -ブチルアントラキノン0.3部の混合液からなるモノマー型のアクリル系感圧接着剤に、平均粒径が7 μ mのホワイトカーボン12部を加えてホモミキサで混合し、均一分散液からなる感圧接着剤を調製した。

次に、前記の感圧接着剤を剥離剤で処理した厚さ50 μ mのポリエチレンフィルムからなるセバレータの上にスクリーン印刷方式で30 μ mの厚さで部分的に塗布した。塗布速度は0.1m/秒である。また、部分塗布のパターンは直径1mmの円が1mmの間隔で点在するものとした。

ついで、前記の塗布物を真空雰囲気下に80W/cmのメタハラドランプを用いて20cm離れた位置より紫外線を20秒間照射し、感圧接着剤を重合処理して感圧接着層が点在する粘着部材を得た。

α -ブチルアントラキノン0.2部からなる混合液に、平均粒径が7 μ mのホワイトカーボン3部を加えてホモミキサで混合し、均一分散液からなる感圧接着剤を得た。

評価試験

〔糊切れ性〕

実施例、比較例で得た感圧接着剤をポリエステルフィルムの上に、厚さ50 μ m、直径10mmの塗布層が5mmの間隔で点在するよう塗布速度0.1m/秒の条件で塗布した際、感圧接着剤が糸引きを起こすか否かを調べ、糸引きを起こさない場合を○、起こした場合を×として評価した。

〔パターン維持性〕

前記に準じて形成したポリエステルフィルム上の塗布層の直径が10mmから11mmになるまでの時間を調べた。

〔接着力〕

実施例、比較例で得た感圧接着剤をポリエステルフィルム上にベタ塗りし、これを各実施例ないし比較例に準じ重合処理し、得られた粘着部材に

前記の粘着部材における感圧接着層面をステンレス板に圧着したのち、それを剥離除去したところ、圧着部分における全ての感圧接着層の点がセバレータよりステンレス板に移着した。

実施例 4

アクリル酸ブチル88部、アクリル酸2部、オリゴアクリレート10部及びアントラキノン0.5部の混合液からなるモノマー型のアクリル系感圧接着剤に、平均粒径が7 μ mのホワイトカーボン6部を加えてホモミキサで混合し、均一分散液からなる感圧接着剤を調製し、これを用いて実施例1に準じ粘着部材を得た。

比較例 1

ホワイトカーボンを加えないほかは実施例4に準じて感圧接着剤を得た。

比較例 2

実施例4で用いたオリゴアクリレート100部、

つき JIS Z 1528に準拠してステンレス板に対する接着力を調べた。なお、実施例2の感圧接着剤の重合処理条件は7Mradの電子線照射量とした。

〔保持力〕

前記で得た粘着部材をステンレス板に対し20mm×20mmの接着面積で貼着し、40℃下、1kgの垂直荷重を負荷して粘着部材が落下するまでの時間を調べた。

上記の試験結果を表に示した。

	実 施 例				比 較 例	
	1	2	3	4	1	2
糊 切 れ 性	○	○	○	○	○	×
パターン維持性(秒)	>30	>30	>30	>30	0	>30
接着力(g/20mm)	500	400	600	500	600	100
保 持 力 (分)	>60	>60	>60	>60	>60	0

表より本発明の感圧接着剤は、糸引きを起こし

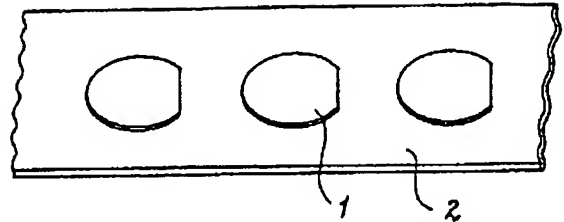
にくくて良好なパターン塗布作業性を示し、形成された塗布パターンは形状維持性に優れると共に、これを重合処理した感圧接着層は接着力と保持力に優れていることがわかる。

4. 図面の簡単な説明

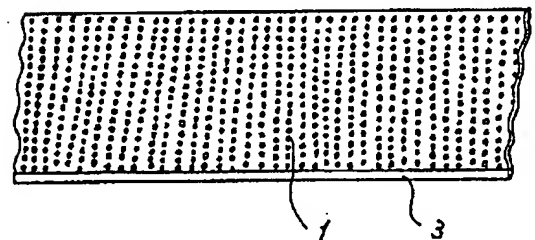
第1図、第2図は感圧接着層を部分的に有する粘着部材の構成例の斜視図である。

- 1：感圧接着層
- 2：薄葉体（支持基材）
- 3：セパレータ（支持基材）

第1図



第2図



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PRESSURE-SENSITIVE ADHESIVE AS WELL AS ADHESIVE MATERIAL THEREOF
AND METHOD FOR ITS MANUFACTURE

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Claims

1. Pressure-sensitive adhesive characterized by the fact that it has alkyl acrylate esters as components and that it has a thixotropic viscosity characteristic imparted by mixing

microparticles with a mean grain size of less than 100 μm into an acrylic pressure-sensitive adhesive comprising component monomers in an unpolymerized state.

2. Adhesive material that has localized pressure-sensitive adhesive layers characterized by the fact that they are made by polymerizing a pressure-sensitive adhesive described in Claim 1 that is coated onto portions of a substrate.

3. Method for manufacturing the adhesive material described in Claim 2 characterized by the fact that the pressure-sensitive adhesive described in Claim 1 is coated onto portions of a substrate and this pressure-sensitive adhesive is polymerized with ultraviolet rays or radiation.

Detailed explanation of the invention

Industrial application field

The present invention pertains to a pressure-sensitive adhesive comprising microparticles in a monomeric acrylic pressure-sensitive adhesive and having good pattern coatability, as well as an adhesive material that has localized layers of said pressure-sensitive adhesive, and a method for its manufacture.

Background of the invention

It has been a long time since the presentation of adhesive materials made by providing pressure-sensitive adhesive layers on portions of a substrate, has been news. Such adhesive materials are used, for example, as carrier tapes for arraying and immobilizing attached objects in methods that automatically manufacture desired products by continuously feeding various attached objects such as electronic parts into assembly lines, etc. In these cases, in addition to [the desirability of] omitting the formation of extraneous portions that will not be used for adhesion of the attached objects, the demand for localized application or pattern coating of pressure-sensitive adhesive layers is based on the fact that sometimes the extraneous portions of pressure-sensitive adhesive layers cause fatal defects such as dust, etc., readily adhering to these extraneous portions and causing contamination of the attached objects, or when the carrier tape on which the attached objects are arrayed and immobilized is stored as a roll, the attached objects becoming imbedded, albeit very slightly, in the pressure-sensitive adhesive layer and the side surfaces of the attached objects thereby being contaminated by the pressure-sensitive adhesive and hindering assembly, with peeling and removal of the attached objects from the carrier tape becoming difficult because of this imbedding and utilization in automated assembly lines becoming impossible.

Prior art and problems

For pressure-sensitive adhesives prepared in the past for uses that involved localized application on substrates, solvent-rich dilutions, water dispersions, and blends of monomeric pressure-sensitive adhesives comprising component monomer in an unpolymerized state with polymers have been known.

However, with the dilution-type pressure-sensitive adhesives, cobwebbing of the pressure-sensitive adhesive would occur when pattern coating was performed by screen-printing or gravure coating. A very slow coating rate was necessary to prevent this and there was a problem of poor coating efficiency.

Meanwhile, with the water dispersion-type pressure-sensitive adhesives, the water resistance of the formed pressure-sensitive adhesive layers was poor and there was a problem of significant practical limitation.

On the other hand, those made by blending polymers in monomeric pressure-sensitive adhesives started to flow immediately after being coated onto the substrate. By the time of the polymerization treatment, the coated pattern had deformed and forming the pressure-sensitive adhesive layer in desired patterns was a difficult problem.

Means to solve the problems

The present invention overcomes the above problems with adhesives made by blending microparticles in monomeric acrylic pressure-sensitive adhesives.

That is, the present invention presents an acrylic pressure-sensitive adhesive having alkyl acrylate esters as components and having a thixotropic viscosity characteristic imparted by mixing microparticles with a mean grain size of less than 100 μm into the acrylic pressure-sensitive adhesive comprising component monomers in an unpolymerized state, as well as

an adhesive material that has localized pressure-sensitive adhesive layers that are characterized by the fact that the above pressure-sensitive adhesive coated onto portions of a substrate, is polymerized, and

a method for manufacturing the above adhesive material characterized by the fact that the above pressure-sensitive adhesive is coated onto portions of a substrate and this pressure-sensitive adhesive is polymerized with ultraviolet rays or radiation.

Effect

By using a monomeric acrylic pressure-sensitive adhesive, it is possible to adjust the component monomer composition as desired and it is also possible to easily form pressure-sensitive adhesive layers with good water-resistance. Moreover, by mixing

microparticles of a mean grain size of less than 100 μm into this to increase the viscosity while also imparting a thixotropic viscosity characteristic, the problem of cobwebbing during coating of the pressure-sensitive adhesive is avoided, making high-speed pattern coating possible.

Furthermore, the formed coated layer holds its pattern or shape well. Also, by polymerizing the partially coated pressure-sensitive adhesive using ultraviolet rays or radiation, quick and efficient polymerization after coating is possible and it is possible to form pressure-sensitive adhesive layers with excellent pattern precision.

Illustration of component elements of the invention

In the present invention, monomeric acrylic pressure-sensitive adhesives, that is, acrylic pressure-sensitive adhesives containing a component monomer in an unpolymerized state, are used.

These acrylic pressure-sensitive adhesives have alkyl acrylate esters as components. One, two, or more kinds of alkyl acrylate esters comprising acrylic acid or methacrylic acid with alkyl groups usually of fewer than 20 carbons such as methyl groups, ethyl groups, propyl groups, butyl groups, 2-ethylhexyl groups, isooctyl groups, isononyl groups, isodecyl groups, dodecyl groups, lauryl groups, tridecyl groups, pentadecyl groups, hexadecyl groups, heptadecyl groups, octadecyl groups, nonadecyl groups, or eicosyl groups, are used.

For other monomers that are sometimes used for monomer components forming the acrylic pressure-sensitive adhesives, modifying monomers represented by acrylic acid, methacrylic acid, itaconic acid, hydroxyethyl acrylate, hydroxyethyl methacrylate, hydroxypropyl acrylate, hydroxypropyl methacrylate, N-methylol acrylamide, acrylonitrile, methacrylonitrile, glycidyl acrylate, glycidyl methacrylate, vinyl acetate, styrene, etc., can be cited. One, two, or more kinds of modifying monomers are used as needed, depending on the objective of modification, for example, imparting cross-linkability, improvement of aggregating strength, improvement of adhesive strength, improvement of water-resistance, etc. The amount used of the modifying monomers is optionally determined. Normally, however, it is less than 100 parts by weight, especially less than 50 parts by weight per 100 parts by weight of alkyl acrylate ester.

In the acrylic pressure-sensitive adhesives used in the present invention, polymerization adjustors such as lauryl mercaptan or thioglycolic acid, cross-linking agents for adjusting adhesive strength or aggregating strength such as multifunctional epoxy compounds, multifunctional isocyanate compounds, or multifunctional melamine compounds, cross-linking adjustors comprising multifunctional compounds such as divinylbenzene, ethylene glycol diacrylate, or trimethylolpropane trimethacrylate are blended as needed. The amount of these

blended is optionally determined. Normally, however, it is less than 50 parts by weight, especially less than 10 parts by weight per 100 parts by weight of component monomer.

When polymerizing with ultraviolet rays, well-known photopolymerization initiators such as benzoin, benzoin methyl ether, benzophenone, anthraquinone, t-butyl anthraquinone, diethoxyacetophenone, etc., are blended as needed. Normally, 0.05-10 parts by weight per 100 parts by weight of component monomer is appropriate for the amount of these blended.

The pressure-sensitive adhesives of the present invention are made by mixing microparticles with a mean grain size less than 100 μm into the acrylic pressure-sensitive adhesive.

The microparticles are mixed as agents to adjust the viscosity characteristics of the acrylic pressure-sensitive adhesive. 1-20 parts by weight per 100 parts by weight of component monomer is appropriate for the amount mixed; 3-15 parts by weight is preferable. If this mixed amount is less than 1 part by weight, imparting of a thixotropic viscosity characteristic is poor and for the pressure-sensitive adhesive obtained, the pattern maintenance of coated layers is poor. Meanwhile, if 20 parts by weight is exceeded, the pressure-sensitive adhesive obtained lacks adhesive strength.

Microparticles to be used can be anything that makes the viscosity of the acrylic pressure-sensitive adhesive thixotropic. White carbon and carbon black are used particularly favorably. In terms of imparting the thixotropic viscosity characteristic, microparticles with a mean grain size of 5-50 μm are favorable. Two or more kinds of microparticles can be used together when necessary. When polymerizing the pressure-sensitive adhesive with ultraviolet rays, white carbon is favorably used in terms of its processibility. For white carbon, commercial products exist such as, for example, Aerosil #200 or #300 (trade name, made by Aerosil Co.), and Nibasil VN3 (trade name, made by Nippon Silica Kogyo Co.). For carbon black, commercial products exist such as Asahi #80 and #70H (trade names, made by Asahi Carbon Co.) and Seast 3 and 3H (trade names, made by Tokai Denkyoku Co.).

In the pressure-sensitive adhesives of the present invention and the acrylic pressure-sensitive adhesives used in their formation, organic solvents, polymers or rubber, copolymerizing macromonomers, stickiness-imparting resins, plasticizers, etc., can be added to adjust the viscosity or flow characteristics, adjust adhesive characteristics, etc. Foaming agents or microballoons can also be added so that foaming structures can be formed. The amounts added can be optionally determined.

When preparing the pressure-sensitive adhesive, the acrylic pressure-sensitive adhesive, microparticles, and other blended agents or additives used as needed, can be mixed in an appropriate order. It is particularly good to prepare [the adhesive] as a homogeneous mixture. For mixing, one, two, or more stirrer-dispersers such as kneaders, mixing rollers, Miki rollers,

sandmills, ball mills, homomixers, ultrasonic generators, dispersers, homogenizers, dissolvers, etc., can be combined as desired and used.

The adhesive materials of the present invention are ones in which such pressure-sensitive adhesives are coated onto portions of a substrate and localized pressure-sensitive adhesive layers are formed by polymerizing these.

They can be manufactured, for example, by coating a pressure-sensitive adhesive onto portions of a substrate by an appropriate localized coating method such as screen printing or gravure coating, and polymerizing this coated layer with ultraviolet rays or radiation. The coating pattern for the pressure-sensitive adhesive is optional and can be optionally determined according to the intended use. When obtaining carrier tapes for attached objects that consist of electronic parts, etc., for example, at intervals corresponding to the prescribed array interval for the attached object, pressure-sensitive adhesive layers of a shape corresponding to the shape of the adhesive surface of the object to be attached, or of an area smaller than this are provided.

Appropriate substances can be used for the substrate. As shown in Figure 1, plastic films such as polyethylene, polypropylene, or polyester, or thin sheets such as foam sheets, paper or laminated paper, woven fabric or nonwoven fabric, their laminates, or metal foils, can be used for substrate 2 to make carrier tapes or adhesive tapes having localized pressure-sensitive adhesive layer 1, or attached objects such as metal plates or glass plates can be used as substrate and be made so that they can adhere to other attached objects. Moreover, separators formed by treating plastic films or laminated paper with a release agent can be used for the substrate. In this case, glue transfer tape that transfers the pressure-sensitive adhesive layer on the separator to an object to be attached can be obtained. As shown in Figure 2, if pressure-sensitive adhesive layer 1 is placed in a dotted form on separator 3, a glue transfer tape can be produced that can be used for various shapes of objects to be attached. For glue transfer tapes, by adhering the object to be attached to the pressure-sensitive adhesive layer 1 thereof and peeling, the pressure-sensitive adhesive layer is transcribed and transferred to the object to be attached and the coating shape of the pressure-sensitive adhesive layer on the attached object is formed, so the advantage exists that it is unnecessary to cut and shape the adhesive tape to the shape of the object to be attached.

The coating thickness of the pressure-sensitive adhesive on the substrate can be determined as appropriate. With the present invention, formation of coating layers and pressure-sensitive adhesive layers exceeding 3 mm is also possible.

In terms of polymerizability, it is preferable that polymerization of the localized pressure-sensitive adhesive coating by ultraviolet rays or radiation such as electron beams be performed in an oxygen-blocking atmosphere such as with nitrogen gas replacement, in water, or with a covering using a transparent covering material such as a separator.

Effect of the invention

Since the present invention converts a monomeric acrylic pressure-sensitive adhesive into a pressure-sensitive adhesive having a thixotropic viscosity characteristic by mixing microparticles into it, occurrence of cobwebbing during coating and flow deformation after coating is not easy and localized coating in prescribed pattern shapes is possible with good precision and high speed. Moreover, coating layers have excellent thickness uniformity and the ability to form coated layers of a large layer thickness is also excellent.

Consequently, with such pressure-sensitive adhesives, it is possible to easily obtain adhesive materials having pressure-sensitive adhesive layers with no extraneous portions with respect to attached objects. Moreover, the adhesive materials formed have pressure-sensitive adhesive layers of excellent pattern-forming precision. Furthermore, by polymerization using ultraviolet rays or radiation, adhesive materials having foam sheets as the substrate can also be easily and efficiently obtained.

Application examples

Application Example 1

To a monomeric acrylic pressure-sensitive adhesive made of a mixture of 97 parts (parts by weight, same below) of butyl acrylate, 3 parts of acrylic acid, 0.2 part of ethylene glycol diacrylate and 0.5 part of t-butyl anthraquinone, 6 parts of white carbon of mean grain size 7 μm were added. A homomixer was used for mixing and a pressure-sensitive adhesive made of a homogeneous dispersion was prepared.

Next, the above pressure-sensitive adhesive was partially coated at a thickness of 50 μm onto a polyester film of 50 μm thickness by the screen-printing method. The coating rate was 0.1 m/sec. Moreover, the pattern of the localized coating was circles of 10 mm diameter at 5 mm intervals.

Then, the coated product above was irradiated with ultraviolet rays for 20 sec from a distance of 20 cm using a metalhalide lamp of 80 W/cm under a nitrogen atmosphere and the pressure-sensitive adhesive was polymerized to obtain an adhesive material having circles of pressure-sensitive adhesive layers.

Application Example 2

To a monomeric acrylic pressure-sensitive adhesive made of a mixture of 98 parts of butyl acrylate and 2 parts of acrylic acid, 6 parts of carbon black of mean grain size 50 μm were added. A homomixer was used for mixing and a pressure-sensitive adhesive made of a homogeneous dispersion was prepared.

Next, the above pressure-sensitive adhesive was partially coated with a gravure coater at a thickness of 30 μm on a polyethylene foam of 5 mm thickness. The coating rate was 0.1 m/sec. Moreover, the pattern of the localized coating was circles of 2 mm diameter at 1 mm intervals.

The coated product above was then irradiated with a 7 Mrad electron beam using an electron beam radiator under a nitrogen atmosphere and the pressure-sensitive adhesive was polymerized to obtain an adhesive material of good air-permeability having circles of pressure-sensitive adhesive layers.

Application Example 3

To a monomeric acrylic pressure-sensitive adhesive made of a mixture of 90 parts of isononyl acrylate, 8 parts of vinyl acetate, 2 parts of methacrylic acid, 2 parts of multifunctional isocyanate and 0.3 part of t-butyl anthraquinone, 12 parts of white carbon of mean grain size 7 μm were added. A homomixer was used for mixing and a pressure-sensitive adhesive made of a homogeneous dispersion was prepared.

Next, the above pressure-sensitive adhesive was partially coated at a thickness of 30 μm onto a separator made of a polyethylene film of 50 μm thickness treated with a release agent by screen-printing. The coating rate was 0.1 m/sec. Moreover, the pattern of the localized coating was circles of 1 mm diameter at 1 mm intervals.

The coated product above was then irradiated with ultraviolet rays for 20 sec from a distance of 20 cm using an 80 W/cm metalhalide lamp under a nitrogen atmosphere and the pressure-sensitive adhesive was polymerized to obtain an adhesive material having circles of pressure-sensitive adhesive layers.

After the pressure-sensitive adhesive layer surface of the above adhesive material was applied by pressing onto a stainless steel plate and this was peeled and removed, all of the circles of pressure-sensitive adhesive layers in the pressed area had been transferred from the separator to the stainless steel plate.

Application Example 4

To a monomeric acrylic pressure-sensitive adhesive made of a mixture of 88 parts of butyl acrylate, 2 parts of acrylic acid, 10 parts of oligoacrylate and 0.5 part of anthraquinone, 6 parts of white carbon of mean grain size 7 μm were added. A homomixer was used for mixing and a pressure-sensitive adhesive made of a homogeneous dispersion was prepared. Using this, an adhesive material was obtained according to Application Example 1.

Comparative Example 1

Except for not adding white carbon, a pressure-sensitive adhesive was obtained according to Application Example 4.

Comparative Example 2

To a mixture of 100 parts of the oligoacrylate used in Application Example 4 and 0.2 part of t-butyl anthraquinone, 3 parts of white carbon of 7 μm mean grain size were added. A homomixer was used for mixing and a pressure-sensitive adhesive made of a homogeneous dispersion was obtained.

Evaluation tests

Glue cutability

We investigated whether or not cobwebbing occurred with the pressure-sensitive adhesive when the pressure-sensitive adhesives obtained in the application examples and comparative examples were coated onto polyester films under the conditions of a 0.1 m/sec coating rate so that coated layers of 50 μm thickness and 10 mm diameter were dotted at 5 mm intervals. No occurrence of cobwebbing was rated with an O and occurrence thereof with an X.

Pattern maintenance

We investigated the time required for the diameters of the coated layers on the polyester films formed as above to go from 10 mm to 1 mm.

Adhesive strength

We coated the pressure-sensitive adhesives obtained in the application examples and comparative examples onto polyester films and polymerized them according to the respective application example or comparative example. We investigated the adhesive materials obtained for adhesive strength with respect to a stainless steel plate according to JIS Z 1528. The polymerization condition for the pressure-sensitive adhesive of Application Example 2 was a 7 Mrad electron beam radiation dose.

Holding strength

We glued the adhesive materials obtained above onto stainless steel plates with an adhesive surface of 20 mm x 20 mm. At 40°C, perpendicular loads of 1 kg were loaded and the time until the adhesive material dropped was investigated.

The results of the above tests are shown in the table.

	① 実 施 例				比較例 ②	
	1	2	3	4	1	2
③ 割 切 れ 性	○	○	○	○	○	×
④ パターン維持性(秒)	>30	>30	>30	>30	0	>30
⑤ 接着力(g/20mm)	500	400	600	500	600	100
⑥ 保持力(分)	>60	>60	>60	>60	>60	0

- Key: 1 Application Example
 2 Comparative Example
 3 Glue cutability
 4 Pattern maintenance (sec)
 5 Adhesive strength (g/20 mm)
 6 Holding strength (min)

From the table, it can be seen that the pressure-sensitive adhesives of the present invention do not readily cobweb, show good pattern coatability, and form coating patterns that maintain shape well and additionally, that these polymerized pressure-sensitive adhesives have excellent adhesive strength and holding strength.

Brief description of the figures

Figure 1 and Figure 2 are oblique views of example constructions of adhesive materials that have localized pressure-sensitive adhesive layers.

- 1: Pressure-sensitive adhesive layer
 2: Sheet (substrate)
 3: Separator (substrate)

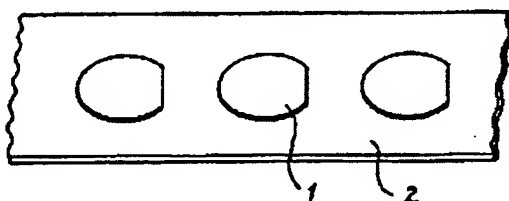


Figure 1

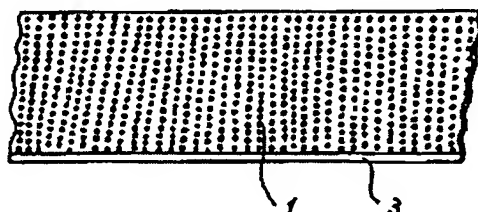


Figure 2

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